PLANT GENETIC RESOURCES UNIT REPORT

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Agricultural Research Service

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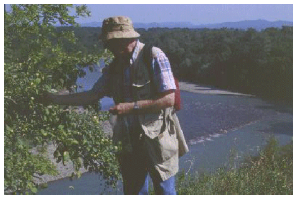
Plant Exchange / Exploration to Russia

by Philip L. Forsline, Horticulturist

A cherry germplasm exchange trip to Russia was conducted between July 11 and July 30, 1998. It was funded by a grant obtained from the USDA, ARS, National Plant Germplasm System (NPGS). Participating were Phil Forsline of the USDA, ARS, PGRU, Geneva, NY, and Amy Iezzoni and Renate Karle, cherry breeders at Michigan State University. They were joined by Manfred Fischer of the Fruit Genebank in Dresden, Germany. Additional sour cherry and cherry rootstock germplasm is desirable for breeding disease-resistant sour cherry cultivars and dwarfing rootstocks for sweet cherry. The germplasm sought consisted of sour and ground cherry and interspecific cherry hybrids. It was found at four of the five Institutes that we visited in Russia that are branches of the Vavilov Institute in St. Petersburg: Pavlovsk, Orel, Michurinsk and Krymsk. The apple collection at Maikop was also visited, and in the nearby Caucasus Moun-tains, 6500 seeds from 28



trees of wild *Malus orientalis* were collected. This plant exchange trip was vital because these programs have had a history of excellent germplasm collection and development activities in the past, but now many of these valuable elite genetic resources are in jeopardy.

Arrangements have been made for the following *Prunus* germplasm to be shipped to NPGS from Russia in the form of dormant scions in January 1999: 1) sour cherry scions with resistance to mid-winter cold and spring freezing temperatures along with resistance to cherry leaf spot caused by *Blumeriella jaapii* and twig brown rot caused by *Monilinia laxa*; 2) cherry rootstocks including unique interspecific hybrids that are cold hardy, can be propagated vegetatively and are likely to be graft compatible with sweet and sour cherries; and 3) wild species of *Prunus* not represented in collections in the NPGS. *Pyrus* germplasm was also observed at four of the sites and requests for some of this germplasm will also be made after consulting with Kim Hummer, the NPGS Pear Curator in Corvallis, OR.

Because the scions of *Prunus* accessions must be processed through the USDA APHIS quarantine facility in Beltsville, MD, it will be at least three years before they are released to programs in the National Plant Germplasm System. The cherry germplasm targeted for use by sour cherry breeders and researchers will be maintained at PGRU in Geneva and will also be grown by Dr. Iezzoni at Michigan State University where they will be evaluated further and used in her breeding programs. Phil Forsline has communicated with the curators at Davis CA (Chuck Simon) and at Corvallis, OR (Kim Hummer) about the maintenance of other *Prunus* and *Pyrus* germplasm that will be requested.

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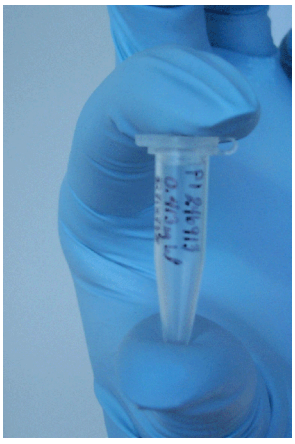
Malus and Vitis Core Subset DNA Availability

by Amy Szewc-McFadden, Molecular Biologist

Some of the researchers that utilize PGRU's *Malus* and *Vitis* accessions are interested in the genetic

information contained within these accessions. For example, researchers such as plant breeders may be interested in gene identification and mapping for disease resistance. By employing a variety of DNA analyses, this can be accomplished. Often the first step of these researchers is to obtain either clones of the accession or leaves of the plant from which to extract the DNA. This step is time and resource consuming, especially if it is a foreign order which must be accompanied by an import permit allowing for a full research exemption for any and all pathogens and pests.

In order to serve genetic researcher's needs more efficiently, DNA has been extracted and made available for all accessions in the *Malus* and *Vitis* core subsets. The DNA is



available in aliquots of 5 micrograms. It can be utilized in genetic techniques such as restriction enzyme digests and PCR applications. There usually is no need for an import permit. Now we can supply our customers not only with germplasm in the form of seeds, clones, and pollen but also with DNA.

In situ Preservation of North American Grapes

by Warren F. Lamboy, Research Leader

PGRU and Diane Pavek and Ned Garvey of the USDA, ARS Plant Exchange Office, in Beltsville, MD, are finishing a study on in situ preservation of the North American wild grape species, *Vitis rupestris*. In 1997, a domestic exploration for this grape species located 24 different wild populations of this species. Based on morphological and DNA characteristics and diversity, seven populations, all on public land, were recommended for in situ preservation. So far, two of these populations have been established as in situ preserves, one of which has over 10,000 individuals. This compares favorably to the 35 different living plants of *Vitis rupestris* that are in the ex situ grape collections of the National Plant Germplasm System.

Apple Repropagation

by Bill Srmack, Operations Manager, Clonal

After the severe fire blight epidemic of 1996, over 400 infected apple trees were removed from the PGRU orchard. Replacements for these 400 trees were temporarily repropagated on standard seedling rootstock and held. Then, in August 1998, we started the repropagation of these same fire blight susceptible accessions to a semi-dwarf rootstock, EMLA 7. Thus began the phased repropagation of the entire collection onto EMLA 7. Such trees will be free standing, and less vigorous. The latter characteristic should reduce the incidence of fireblight in susceptible scion varieties, and the rootstock itself is moder-ately resistant to fireblight. These smaller trees will be easier to manage for pruning, spraying and harvesting. In 1998, the first 400 accessions were budded (five rootstocks per accession) in the nursery. We will continue to propagate approximately 400 accessions each year until completion. After first propagating the most fire blight susceptible accessions, we will continue re-propagating starting with oldest trees in the current seedling orchard. The process should be complete in five to six years. Starting in the spring of 2000, the crop of trees budded in August 1998 on EMLA 7 will be planted in a new orchard where two trees of each accession will be planted six feet apart with 18' rows. After three years in the orchard every other tree will be removed so that trees to be held for long term will be 12' apart.

Database Group

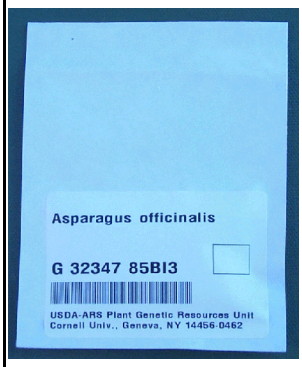
by Steve King, Information Supervisor

Computing technology has had a radical facelift within the last several months here at the PGRU. A new file server and network wiring infrastructure was installed late last year, and this year workstations have been upgraded to the Pentium II class. These changes insure better data security, increase personal productivity, and prepare the unit for the "Y2K" or "Millennium Bug".

Another technical innovation has been the purchase of a Kodak "Megapixel" camera. This digital camera produces photo quality electronic images. Presently, the camera is being used to take grape cluster and berry pictures of the *Vitis* core subset. These pictures will be loaded into the *Vitis* accession records stored in the National Plant

Germplasm System database called GRIN. GRIN can be found on the World Wide Web at the following URL, http://www.ars-grin.gov/npgs/. The intended use of the images is to aid potential requesters in their search for specific fruiting characteristics or accession identification. In the spring, photos of leaves, tendrils and dormant nodes will be added. Further information on this project, and much more, can be found on the PGRU website located at, http://www.ars-grin.gov/gen/.

The database group has also been hard at work bringing the *Asparagus* collection on board. This is a new collection for the site, and with it come some interesting challenges. One challenge that the database is dealing with is the proper identification of the accessions and lots during the repackaging of the seed. This process involves checking accession information in Plant Introduction (PI) books against records held in GRIN, collecting any overlooked data that may be noted on original seed packets, and building an inventory of the different seed lots within accessions. This information is all entered into a local database, and once ready, is loaded into the GRIN database.



Plant Genome

by Sam Cartinhour, Informatician

The Plant Genome Database project provides scientists with information about crop species that can be used in research projects. The project now supports public databases for wheat and its relatives, rice, tomato, potato and pepper, apple and (most recently) members of the *Brassicaceae* or Crucifer family. Information ranges from bibliographic references and newsletters to genetic maps and passport data. The databases can accessed via the WWW at http://probe.nalusda.gov:8000.

The databases are updated continuously. Recent additions include QTL data for tomato and potato, passport and genetic marker data on 200 accessions from the apple collection, and WWW versions for three editions of the Barley Genetic Newsletter.

Plant Introduction Collaboration in Vegetable Nutrition

by Paul Kisly, Greenhouse Manager

The Plant Genetic Resources Unit, Geneva, NY, in conjunction with the USDA, ARS Plant, Soil and Nutrition Laboratory, Ithaca, NY has evaluated genotypic differences among *Brassica* species, subspecies and accessions for Selenium (Se) uptake and accum-ulation in edible tissues.

A field trial conducted with 40 accessions of *Brassica* species using Se amended soils indicated a large variation among species, subspecies and accessions in ability to take up Se. Some accessions took up three times the amount of Se that others did, and some broccoli accessions had a significantly lower uptake of Se. Greenhouse trials are presently underway to confirm this variation in uptake ability.

Introduction of a higher level of Se or any other trace element into the diet of a society with a deficiency is an important step in the fight against world malnutrition and hunger.

Increasing Efficiency in Use of Honeybees for Pollination of Multiplication Plots

by Shawn Kime, Pollination Technician

Preparing 100 nuclear hives or "nucs" for the pollination of *Brassica* and *Raphanus* cages is a costly and time consuming process. It involves purchasing a hundred queen honeybees, taking frames of brood and honey and pollen from parent hives and putting them together in nuc boxes. By next spring, though, the time and expense of preparing nucs at the Plant Genetic Resources Unit could be greatly reduced. This is because we are testing different methods of overwintering nucs. These mostly involve creating a double sized nuc, which has more bees and is more likely to live through the winter. Since it is double sized, the surviving colonies can be split in half to make two new nucs. One nuc will have a queen and the other will make its own new queen. Consequently, fifty surviving

double nucs will produce sufficient nucs to meet our pollination needs without buying additional queens. Although it is highly unlikely that all of our double nucs will survive the winter, future years will allow us the opportunity to increase the number of overwintering nucs. This will result in less time and money spent on preparation of hives for pollination of the *Brassica* and *Raphanus* seed regeneration plots.

DNA Fingerprinting in Pear

by Warren F. Lamboy, Research Leader

In a germplasm repository, correct identification of plant material is absolutely essential. One type of DNA fingerprinting, SSRs (simple sequence repeats) has been found to be useful for this purpose in both PGRU's apple and grape collections. Because apple and pear are extremely closely related, SSRs originally developed for apple were tested in a preliminary analysis of four important European pear cultivars (*Pyrus communis* cvs. Bartlett, Bosc, Comice, and Anjou). Using only the SSR fingerprints from five different loci (chromosomal locations), all four cultivars could be unambiguously distinguished from one another. Because of our success in this initial study, Kim Hummer of the USDA-ARS germplasm repository in Corvallis, OR and PGRU have submitted a grant proposal to expand it to include 40 pear cultivars of commercial importance.

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